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Drinking Water Surveillance Program

SUDBURY (RAMSEY LAKE) WATER TREATMENT PLANT

Annual Report 1987

Environment Ontario
Jim Bradley, Minister

LEGISLATIVE ASSEMBLY ONTARIO
NOV 22 1990

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SUDBURY (RAMSEY LAKE) WATER TREATMENT PLANT

DRINKING WATER SURVEILLANCE PROGRAM

ANNUAL REPORT 1987

ONTARIO MINISTRY OF ENVIRONMENT
OCTOBER 1988

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ACKNOWLEDGEMENTS

The Drinking Water Surveillance Program (DWSP) employs a team approach requiring the co-operative effort of the Ministry of the Environment (MOE) staff from Water Resources and Laboratory Services Branch and the Regions, as well as plant operational staff from the Municipalities.

This annual report was produced by the DWSP Group (Ron Hunsinger, Peter Bohm, Carol Sackville-Duyvelshoff, Chris Fung and John McGrachan) and by Pat Lachmaniuk (on developmental assignment to the Drinking Water Section). Helpful input and reviews were received from Drinking Water Section Staff, in addition to reviews by other MOE and municipal personnel.

EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

SUDBURY (RAMSEY LAKE) WATER SUPPLY
1987 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. Currently, 44 plants are being monitored.

The Sudbury (Ramsey Lake) Water Supply is a pumping station that disinfects, fluoridates and adjusts pH for the water from Ramsey Lake. This supply along with the Wanapitei Water Treatment Plant serves a population of 95,000 and has a design capacity of 50 x 1000m3/day.

Samples of two distribution system sites were taken eight times in 1987 and analyzed for approximately 160 parameters. Parameters were divided into the following groups Bacteriological, Inorganic and Physical(Laboratory Chemistry, Field Chemistry and Metals) and Organics (Chloroaromatics, Pesticides and PCB, Specific Pesticides and Volatiles). While some Specific Pesticides results were reported, samples were not submitted for Chlorophenol analysis.

A summary of results is shown in Table 1.

Due to its sampling frequency of once per month, the DWSP is not designed to evaluate all aspects of the bacteriological quality of water; however routine bacteriological monitoring as recommended in the Ontario Drinking Water Objectives (ODWO) is carried out by the operating authority. In terms of the limited DWSP bacteriological examination the water was of good quality.

Inorganic and Physical parameters (Laboratory Chemistry, Field Chemistry and Metals) were below any applicable health related ODWOs.

Of approximately 110 Organic parameters tested for on a monthly basis, none exceeded health related guidelines.

Many of the substances detected are naturally occurring or treatment by-products.

During 1987 the DWSP sampling results indicated that the Sudbury (Ramsey Lake) Water Supply produced good quality water throughout the distribution system.

SOMMAIRE

PROGRAMME DE SURVEILLANCE DE L'EAU POTABLE

STATION D'ALIMENTATION EN EAU DE SUDBURY (LAC RAMSEY)
RAPPORT ANNUEL 1987

Le Programme de surveillance de l'eau potable (PSEP) de l'Ontario fournit des informations immédiates, fiables et à jour sur la qualité de l'eau potable. Le PSEP a débuté officiellement en avril 1986. Il est destiné à englober tous les réseaux municipaux d'alimentation en eau de l'Ontario. Actuellement, 44 stations en font partie.

La station d'alimentation de Sudbury (lac Ramsey) est une station de pompage qui assure la désinfection et la fluoration de l'eau du lac Ramsey et en ajuste le pH. Cette station, avec la station d'épuration de la rivière Wanapitei, dessert une population de 95 000 habitants et a une capacité nominale de 50 x 1 000 m3/jour.

En deux points du réseau de distribution, 8 échantillons ont été prélevés en 1987 et analysés par rapport à environ 160 paramètres dans les catégories suivantes : bactériologique, inorganique et physique (analyses en laboratoire et sur place, présence de métaux) et organique (composés aromatiques chlorés, pesticides et BPC, pesticides particuliers et composés volatils). Bien que certains pesticides particuliers aient été signalés, la présence de chlorophénols n'a pas été vérifiée.

Le tableau 1 résume les résultats obtenus.

En raison de la fréquence des prélèvements (un par mois), le PSEP ne permet pas d'évaluer tous les aspects de la qualité bactériologique de l'eau. Cependant, comme on le recommande dans le cadre des objectifs relatifs à la qualité de l'eau potable en Ontario, un contrôle bactériologique systématique est effectué par l'exploitant. L'analyse bactériologique limitée du PSEP a révélé une eau de bonne qualité.

Les mesures des paramètres inorganiques et physiques (analyses en laboratoire et sur place, présence de métaux) étaient inférieures aux limites applicables fixées par l'Ontario pour la santé.

Pour environ 110 paramètres organiques mesurés chaque mois, aucun résultat n'a dépassé les limites acceptables fixées pour la santé.

Un grand nombre de substances détectées apparaissent naturellement ou sont des produits dérivés de l'épuration.

Les résultats des analyses effectuées en 1987 dans le cadre du PSEP ont indiqué que l'eau distribuée à partir de la station d'alimentation de Sudbury (lac Ramsey) était de bonne qualité.

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P.

SUMMARY TABLE BY SCAN (1987)

SCAN	SITE 1 TESTS	SITE 1 POSITIVE	SITE 1 %POSITIVE	SITE 2 TESTS	SITE 2 POSITIVE	SITE 2 %POSITIVE
BACTERIOLOGICAL	21	3	14	48	14	29
CHEMISTRY (FLD)	51	51	100	74	74	100
CHEMISTRY (LAB)	182	161	88	296	257	86
METALS	214	111	51	318	168	52
CHLOROAROMATICS	65	0	0	104	0	0
PESTICIDES & PCB	128	0	0	203	0	0
SPECIFIC PESTICIDES	54	0	0	81	0	0
VOLATILES	167	20	11	252	29	11
TOTAL	882	346		1376	542	

NO HEALTH RELATED GUIDELINES/LIMITS WERE EXCEEDED

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE

A '.' INDICATES THAT NO SAMPLE WAS TAKEN

DRINKING WATER SURVEILLANCE PROGRAM

SUDBURY (RAMSEY LAKE) WATER SUPPLY
1987 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. Currently, 44 plants are being monitored. Appendix A contains a detailed description of the DWSP.

The DWSP was initiated at the Sudbury (Ramsey Lake) Water Supply in April of 1987.

PLANT DESCRIPTION

The Sudbury (Ramsey Lake) Water Supply is a pumping station which disinfects and fluoridates water from Ramsey Lake. Calcium Hydroxide is used for pH adjustment. This supply along with the Wanapitei Water Treatment plant serves a population of approximately 95,000. It has a design capacity of 50 x 1000m3/day and daily flows ranging from 17 x 1000m3/day to 42 x 1000m3/day. Efforts are currently underway to increase the capacity of the Wanapitei plant and reduce the demand on the Ramsey Lake system.

The plant location is shown in Figure 1. General plant information is presented in Table 2.

METHODS

The raw and treated water at the plant will not be sampled until the sample lines are modified to meet the DWSP requirements. Water samples were obtained from two DWSP approved locations;

i) Distribution System - Site 1 - This house is approximately 2.5 kilometers from the plant. Water was sampled through a copper sample line at the basement laundry tap.

ii) Distribution System - Site 2 - This house is approximately 6.7 kilometers from the plant. Water was sampled through a copper sample line at the basement laundry tap.

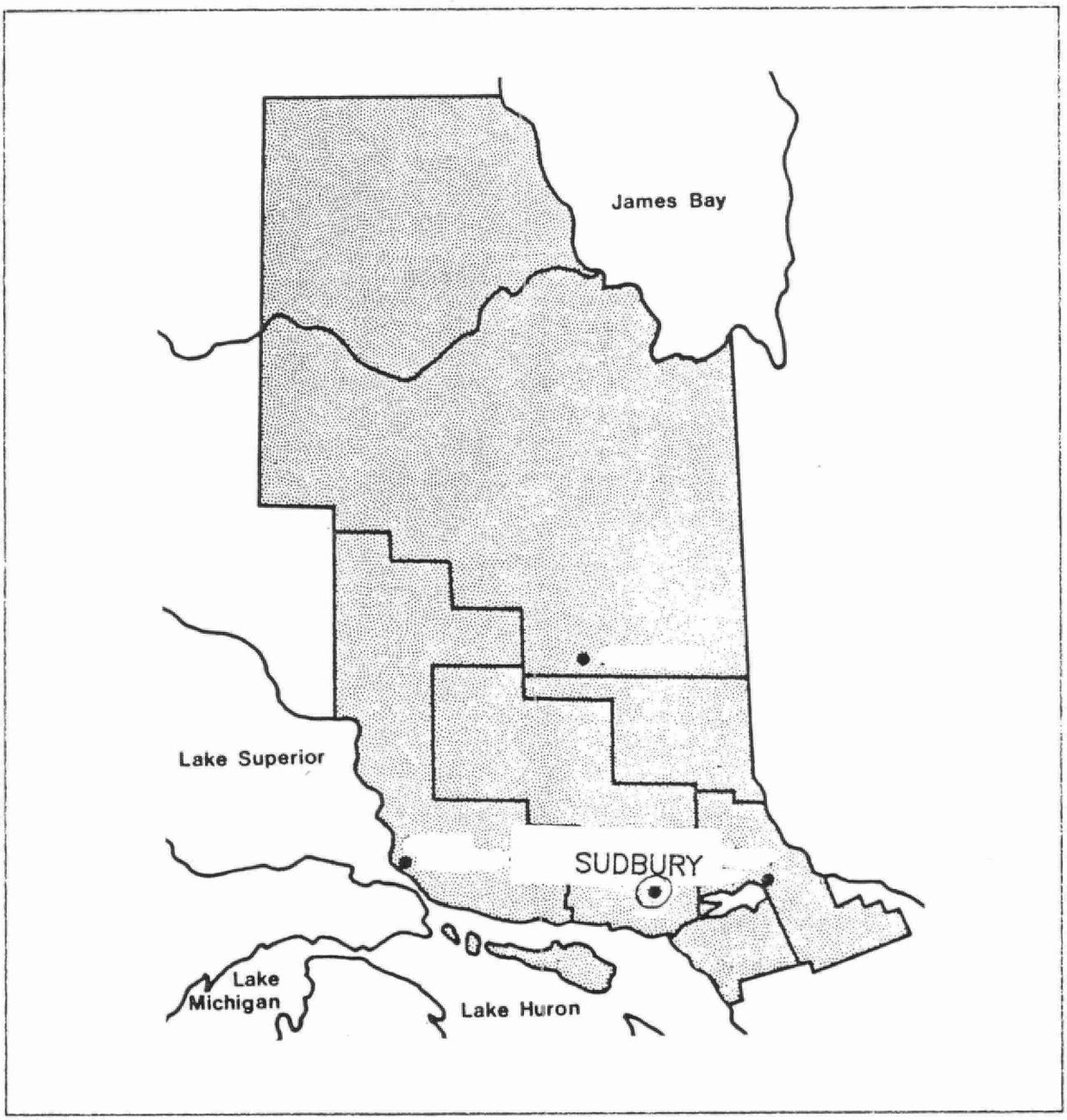
At the distribution system locations two types of samples were obtained: a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples are used to make an assessment of the amount by which the levels of inorganic compounds and metals may be changed on standing due to leaching from (or deposition on) the plumbing system. The only analyses carried out on these samples therefore, are General Chemistry and Metals. The free flow sample represented fresh water from the distribution main that had been flowing for five minutes before the sample was taken.

FIGURE 1

DRINKING WATER SURVEILLANCE PROGRAM ANNUAL REPORT

SITE LOCATION MAP

LOCATION: SUDBURY WATER TREATMENT PLANT



DRINKING WATER SURVEILLANCE PROGRAM

1987 ANNUAL REPORTS. MAILING LIST

The reports will be sent to the appropriate Regional and District Offices of the Ministry and to the Municipal Management/Municipal Operations staff of the specific plant to which the report refers.

Other reports will be supplied on an as requested basis to the public,Consultants and other clients.

TABLE 2

DRINKING WATER SURVEILLANCE PROGRAM ANNUAL REPORT

GENERAL INFORMATION

SUDBURY (RAMSEY LAKE) WATER SUPPLY SYSTEM

LOCATION:	DAVID STREET SUDBURY, ONTARIO
SOURCE:	RAW WATER SOURCE - RAMSEY LAKE
DESIGN CAPACITY:	50.0 (1000 M3/DAY)
OPERATION:	MUNICIPALITY
PLANT SUPERINTENDENT:	J. KREIG
MINISTRY REGION:	NORTHEAST
DISTRICT OFFICER:	J.G. ROBERTSON

MUNICIPALITY SERVED	POPULATION
SUDBURY	90,453

Stringent DWSP sampling protocols were followed to eliminate any variance (Appendix B).

Sample day flow, treatment chemical dosages and Field Chemistry measurements such as Turbidity, Chlorine Residuals, pH and Temperature were recorded on the day of sampling and were entered on the DWSP data base.

RESULTS

The Sudbury (Ramsey Lake) Water Supply distribution system was sampled for approximately 160 parameters on a monthly basis beginning in April.

While some Specific Pesticides were reported, samples were not submitted for Chlorophenols.

Table 3 contains information on the sample day retention time, flow rate and treatment chemicals used and their associated dosages.

Table 4 is a summary break-down of the number of water samples analysed for by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment

(MOE) laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 presents parameters not detected.

Associated guidelines and detection limits are also supplied on both tables. Parameters are listed alphabetically within each scan.

DISCUSSION

General

Water quality is judged by comparison with the Ontario Drinking Water Objectives (ODWOs) as defined in the 1984 publication (ISBN 0-7743-8985-0). The Province of Ontario has health related and aesthetic objectives for 49 parameters, these are currently under review. When an ODWO is not available guidelines/limits from other agencies are consulted. The Parameters Listing System (PALIS) recently initiated by the MOE catalogues and keeps current over 1750 guidelines for 650 parameters from agencies throughout the world.

As stated under Results, traces do not indicate quantifiable values, as defined by established MOE Laboratory analytical reporting protocols. While they can be useful in trend analysis or confirmation of the presence of a specific contaminant that is repeatedly detected at these levels, the occasional finding of a trace level of a contaminant is not considered to be significant. **DISCUSSION OF GUIDELINES AND LIMITS THEREFORE, IS ONLY CONDUCTED ON POSITIVE RESULTS.**

Bacteriology

Positive results for the Bacteriology scan were present two times in the distribution system at Site 1 and thirteen times at Site 2 water. The positive parameters were Standard Plate Count, Coliform, Total Coliform and/or Total Coliform Background and Presence/Absence Test.

Coliforms were found as a result of the Presence/Absence test in the May Site 2 water after 48 hours.

Standard Plate Count is a test used to supplement routine analysis for Coliform bacteria. The limit for Standard Plate Count (at 35 °C after 48 hours) in the ODWOs is 500 organisms/mL based on a geometric mean of 5 or more samples. A high Standard Plate Count was present in the distribution system Site 2 water June sampling.

Due to its sampling frequency of once per month, the DWSP is not designed to evaluate all aspects of the bacteriological quality of water. Water in the Sudbury (Ramsey Lake) Water Supply distribution system, in terms of the limited DWSP bacteriological examination, was of good quality.

Inorganic and Physical Parameters

Laboratory and Field Chemistry

The results for Laboratory Chemistry and Field Chemistry scans were below applicable health related ODWOs.

Turbidity in water is caused by the presence of suspended matter such as clay, silt, colloidal particles, plankton and other microscopic organisms. The most important potential health effect of Turbidity is its interference with disinfection in the treatment plant and maintenance of a chlorine residual. The ODWO of 1 Formazin Turbidity Unit (FTU) is only applicable to water leaving the plant.

There are ODWOs that are set for parameters which are related to aesthetic quality rather than health; one of these is Organic Nitrogen. Organic Nitrogen values are calculated by subtracting the value for Ammonia (Ammonium Total) from the value for Total Kjeldahl Nitrogen (Nitrogen Tot Kjeld). The aesthetic ODWO of 0.15 mg/L was exceeded in all of the distribution system samples. When Organic Nitrogen exceeds 0.15 mg/l in treated water some taste and odour problems can result.

This guideline is exceeded in most supplies. Based on the information obtained from the DWSP, which generally indicates no problems with this parameter exceedence, the guideline may be modified when the ODWOs are reviewed.

Colour values exceeded the aesthetic ODWO of 5 True Colour Units (TCU) in three of the distribution system Site 1 standing and free flow samples and nine of the Site 2 waters. Colour in drinking water may be due to the presence of natural or synthetic organic substances as well as certain metallic ions.

As part of the treatment process Sodium Silicofluoride is added to the treated water (Table 3). Where fluoridation is practised, the Fluoride concentration recommended in the ODWO is 1.2 mg/L, plus or minus 0.2 mg/L. While this level was observed in some of the distribution system samples, the Fluoride levels were generally lower than recommended and Table 3 shows underdosing for the sampling dates in June and July.

Metals

The results reported for the Metal scan were below any applicable health related ODWOs.

Cadmium, Copper, Lead and Zinc levels were generally elevated in the standing samples as compared to the free flow samples indicating that these metals were leached from the household plumbing as the water stood overnight. Copper exceeded the

aesthetic ODWO in one standing water but the corresponding free flow sample was well below 1.0 mg/L.

The aesthetic ODWO of .05 mg/L for Manganese was exceeded twice in the April and August free flow samples at Site 2 with levels of .086 mg/L and .054 mg/L. When levels are above the ODWO a bitter taste may be imparted to the water.

The European Economic Community's Maximum Admissable Concentration for Nickel in drinking water of .05 mg/L was exceeded in most of the distribution system samples. In Ontario a guideline value for Nickel has not been considered necessary based on the toxicological data available.

The source water is soft and of low alkalinity; currently there are no data available (in the absence of raw and treated samples) to assess the affects of corrosivity as the water goes from the plant to the houses. The levels of metals however in the standing samples at the distribution system sites would indicate that the pH correction may not be sufficient to completely control the corrosive tendency of the water.

Organic

Chloroaromatics

The results of the Chloroaromatics group showed that three parameters were detected:

1,2,3-Trichlorobenzene

1,2,4,5-Tetrachlorobenzene

Hexachloroethane

1,2,3-Trichlorobenzene was detected at a trace level, once in the distribution system Site 1 water.

1,2,4,5-Tetrachlorobenzene was detected at trace levels, twice in the distribution system Site 1 water.

Hexachloroethane was detected at trace levels, three times in the distribution system Site 1 water.

Review of these results, along with information from other water supplies on DWSP, would indicate that certain Chloroaromatics appear more frequently in the treated water than in the raw and almost always at trace levels. These occurrences could possibly be due to a reaction of chlorine with organics present in the water or in the distribution system.

Chlorophenols

Samples were not submitted for Chlorophenol analysis.

Pesticides and PCB (Polychlorinated Biphenyl)

Within the Pesticides and PCB scan one pesticide was detected:

Alpha BHC

Lindane consists of several isomers of BHC (Benzene Hexachloride). Alpha BHC is the isomer most predominantly found

in the Great Lakes basin as indicated in results from other water supplies on DWSP.

Alpha BHC was detected at trace levels, five times in the distribution system Site 1 water, and four times in the Site 2 water.

Specific Pesticides

Within the Specific Pesticide scan no pesticides were detected.

Volatiles

Within the Volatile scan six parameters, other than Trihalomethanes(THMs), were detected:

Benzene

Toluene

Ethylbenzene

Para and Meta-Xylene

Ortho-Xylene

1,1,1-Trichloroethane

Benzene was detected at trace levels, once in the distribution system Site 1 water. A positive value, 0.65 ug/L was found in the November Site 2 water. This value is below the United States Environmental Protection Agency's (EPA) Maximum Contaminant Level (MCL) for Benzene in drinking water of 5.0 ug/L. Subsequent to the printing of Table 5, Health and Welfare Canada have published a Maximum Acceptable Concentration (MAC) for Benzene in drinking water of 5.0 ug/L.

Toluene was detected at trace levels, twice in the distribution system Site 1 water and four times in the Site 2 water.

Ethylbenzene was detected at a trace level, three times in the distribution system Site 2 water.

Para and Meta-Xylene are reported as one compound and were detected at a trace level, once in the distribution system Site 2 water.

Ortho-Xylene was detected at a trace level, once in the distribution system Site 2 water.

1,1,1-Trichloroethane was detected at a trace level, once in the distribution system Site 2 water.

These volatiles are typically found on an occasional basis at other water supplies included on the DWSP, usually at trace levels.

THMs are acknowledged to be produced during the water treatment process and will always occur in chlorinated surface waters. THMs are comprised mainly of Chloroform, Chlorodibromomethane and Dichlorobromomethane with Bromoform occurring occasionally. Results are reported for the individual compounds as well as for total THMs.

Chloroform, Dichlorobromomethane and Total THMs were always detected in the treated water. Chlorodibromomethane was detected in all but one of the waters. Bromoform was not detected. All THM occurrences were well below the ODWO of 350 ug/L for Total THMs.

CONCLUSIONS

The Sudbury (Ramsey Lake) Water Supply for the sample year of 1987 produced good quality water throughout the distribution system.

No health related guidelines for organic parameters, were exceeded during 1987. No health related ODWOs for inorganic parameters were exceeded.

RECOMMENDATIONS

Three recommendations can be made:

1) The data base should be reviewed in consultation with Regional, Plant and DWSP personnel to determine if sampling location, sampling frequency and the number of parameters analysed could be altered to allow for a more efficient characterization of the water.

2) The sample lines at the pumping station should be modified to meet the DWSP requirements.

3) Fluoridation practice should be reviewed to ensure that the recommended levels are maintained in the distribution system.

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P.

	SAMPLE DAY CONDITIONS		TREATMENT CHEMICAL DOSAGES (MG/L)		
			PRE-CHLORINATION	FLUORIDATION	POST PH ADJUSTMENT
			CHLORINE	SODIUM SILICOFLUORIDE	CALCIUM HYDROXIDE
DATE	RETENTION TIME(HRS)	FLOW (1000 M3)			
APR 15	.0	24.8	2.19	1.12	14.32
MAY 26	.0	18.2	2.01	1.48	7.21
JUN 23	.0	42.4	1.17	.70	5.89
JUL 23	.0	34.7	5.09	.85	8.83
AUG 25	.0	25.5	2.87	1.00	14.16
SEP 29	.0	26.3	2.43	1.07	.
OCT 27	.0	17.9	1.14	1.31	9.46
NOV 24	.0	19.5	1.64	1.40	7.12
DEC 15	.0	21.4	1.90	.	7.50

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P.

SUMMARY TABLE OF RESULTS (1987)

		SITE 1			SITE 2		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL	AEROMONAS SP	.	.	.	3	0	0
	COLIFORM	.	.	.	3	1	0
	E. COLI (P/A)	.	.	.	3	0	0
	FECAL COLIFORM	.	.	.	3	0	0
	P/A BOTTLE	6	0	0	9	3	0
	STANDRD PLATE CNT MF	3	3	0	6	6	0
	STAPH AUREUS	.	.	.	3	0	0
	T COLIFORM BCKGRD MF	6	0	0	9	4	0
	TOTAL COLIFORM MF	6	0	0	9	0	0
*TOTAL SCAN BACTERIOLOGICAL		21	3	0	48	14	0
*TOTAL GROUP BACTERIOLOGICAL		21	3	0	48	14	0
CHEMISTRY (FLD)	FLD CHLORINE (COMB)	10	10	0	2	2	0
	FLD CHLORINE FREE	8	8	0	17	17	0
	FLD PH	11	11	0	18	18	0
	FLD TURBIDITY	.	.	.	1	1	0
	TEMPERATURE	11	11	0	18	18	0
	TOTAL CHLORINE	11	11	0	18	18	0
*TOTAL SCAN CHEMISTRY (FLD)		51	51	0	74	74	0
CHEMISTRY (LAB)	ALKALINITY	11	11	0	18	18	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P.

SUMMARY TABLE OF RESULTS (1987)

SCAN	PARAMETER	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
CHEMISTRY (LAB)	AMMONIUM TOTAL	11	9	2	18	13	5
	CALCIUM	11	11	0	18	18	0
	CHLORIDE	11	11	0	18	18	0
	COLOUR	11	11	0	18	17	1
	CONDUCTIVITY	11	11	0	18	18	0
	CYANIDE	6	0	0	8	0	0
	FLUORIDE	11	11	0	18	18	0
	HARDNESS	11	11	0	18	18	0
	MAGNESIUM	11	11	0	18	18	0
	NITRITE	11	4	6	18	5	11
	NITROGEN TOT KJELD	11	11	0	18	18	0
	PH	11	11	0	18	18	0
	RESIDUE (TOTAL)	11	11	0	18	18	0
	SODIUM	11	11	0	18	18	0
	TOTAL NITRATES	11	5	6	18	6	9
	TURBIDITY	11	11	0	18	18	0
*TOTAL SCAN CHEMISTRY (LAB)		182	161	14	296	257	26
METALS	ALUMINUM	11	9	0	16	13	0
	ARSENIC	11	0	0	18	0	0
	BARIUM	11	11	0	16	16	0
	BERYLLIUM	11	0	0	16	0	0
	BORON	11	2	9	17	2	10

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P.

SUMMARY TABLE OF RESULTS (1987)

SCAN	PARAMETER	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
METALS	CADMIUM	11	4	0	16	8	0
	CHROMIUM	11	1	0	16	4	0
	COBALT	11	1	0	16	4	0
	COPPER	11	11	0	16	16	0
	IRON	11	11	0	16	16	0
	LEAD	11	8	0	16	10	0
	MANGANESE	11	11	0	16	16	0
	MERCURY	5	2	0	8	5	0
	MOLYBDENUM	11	0	0	16	0	0
	NICKEL	11	11	0	16	16	0
	SELENIUM	11	0	0	18	0	0
	STRONTIUM	11	11	0	16	16	0
	URANIUM	11	7	0	17	10	0
	VANADIUM	11	0	0	16	0	0
	ZINC	11	11	0	16	16	0
*TOTAL SCAN METALS		214	111	9	318	168	10
*TOTAL GROUP INORGANIC & PHYSICAL		447	323	23	688	499	36
CHLOROAROMATICS	123 TRICHLOROBENZENE	5	0	1	8	0	0
	1234 T-CHLOROBENZENE	5	0	0	8	0	0
	1235 T-CHLOROBENZENE	5	0	0	8	0	0
	124 TRICHLOROBENZENE	5	0	0	8	0	0
	1245 T-CHLOROBENZENE	5	0	2	8	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P.

SUMMARY TABLE OF RESULTS (1987)

		SITE 1			SITE 2		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
CHLOROAROMATICS	135 TRICHLOROBENZENE	5	0	0	8	0	0
	236 TRICHLOROTOLUENE	5	0	0	8	0	0
	245 TRICHLOROTOLUENE	5	0	0	8	0	0
	26A TRICHLOROTOLUENE	5	0	0	8	0	0
	HEXACHLOROBUTADIENE	5	0	0	8	0	0
	HEXACHLOROETHANE	5	0	3	8	0	0
	OCTACHLOROSTYRENE	5	0	0	8	0	0
	PENTACHLOROBENZENE	5	0	0	8	0	0
*TOTAL SCAN CHLOROAROMATICS		65	0	6	104	0	0
PESTICIDES & PCB	ALACHLOR	6	0	0	9	0	0
	ALDRIN	5	0	0	8	0	0
	ALPHA BHC	5	0	5	8	0	4
	ALPHA CHLORDANE	5	0	0	8	0	0
	ATRATONE	6	0	0	9	0	0
	BETA BHC	5	0	0	8	0	0
	DIELDRIN	5	0	0	8	0	0
	ENDRIN	5	0	0	8	0	0
	ETHYLENE DIBROMIDE	6	0	0	9	0	0
	GAMMA CHLORDANE	5	0	0	8	0	0
	HCB	5	0	0	8	0	0
	HEPTACHLOR	5	0	0	8	0	0
	HEPTACHLOR EPOXIDE	5	0	0	8	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P.

SUMMARY TABLE OF RESULTS (1987)

SCAN	PARAMETER	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
PESTICIDES & PCB	LINDANE	5	0	0	8	0	0
	METHOXYCHLOR	5	0	0	8	0	0
	MIREX	5	0	0	8	0	0
	OPDDT	5	0	0	8	0	0
	OXYCHLORDANE	5	0	0	8	0	0
	PCB	5	0	0	8	0	0
	PP-DDD	5	0	0	8	0	0
	PPDDE	5	0	0	8	0	0
	PPDDT	5	0	0	8	0	0
	THIODAN I	5	0	0	8	0	0
	THIODAN II	5	0	0	8	0	0
	THIODAN SULPHATE	5	0	0	8	0	0
*TOTAL SCAN PESTICIDES & PCB		128	0	5	203	0	4
SPECIFIC PESTICIDES	AMETRYNE	6	0	0	9	0	0
	ATRAZINE	6	0	0	9	0	0
	BLADEX	6	0	0	9	0	0
	METOLACHLOR	6	0	0	9	0	0
	PROMETONE	6	0	0	9	0	0
	PROMETRYNE	6	0	0	9	0	0
	PROPAZINE	6	0	0	9	0	0
	SENCOR	6	0	0	9	0	0
	SIMAZINE	6	0	0	9	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P.

SUMMARY TABLE OF RESULTS (1987)

SCAN	PARAMETER	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
SPECIFIC PESTICIDES	TOXAPHENE	0	0	0	0	0	0
*TOTAL SCAN SPECIFIC PESTICIDES		54	0	0	81	0	0
VOLATILES	1,1 DICHLOROETHANE	6	0	0	9	0	0
	1,1 DICHLOROETHYLENE	6	0	0	9	0	0
	1,2 DICHLOROBENZENE	6	0	0	9	0	0
	1,2 DICHLOROETHANE	6	0	0	9	0	0
	1,2 DICHLOROPROPANE	6	0	0	9	0	0
	1,3 DICHLOROBENZENE	6	0	0	9	0	0
	1,4 DICHLOROBENZENE	6	0	0	9	0	0
	111, TRICHLOROETHANE	6	0	0	9	0	1
	112 TRICHLOROETHANE	6	0	0	9	0	0
	1122 T-CHLOROETHANE	6	0	0	9	0	0
	BENZENE	6	0	1	9	1	0
	BROMOFORM	6	0	0	9	0	0
	CARBON TETRACHLORIDE	6	0	0	9	0	0
	CHLOROBENZENE	6	0	0	9	0	0
	CHLORODIBROMOMETHANE	6	2	4	9	1	7
	CHLOROFORM	6	6	0	9	9	0
	DICHLOROBROMOMETHANE	6	6	0	9	9	0
	DICHLOROMETHANE	5	0	0	9	0	0
	ETHYLBENZENE	6	0	0	9	0	3
	M-XYLENE	6	0	0	9	0	1

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P.

SUMMARY TABLE OF RESULTS (1987)

SCAN	PARAMETER	SITE 1 TOTAL	SITE 1 POSITIVE	SITE 1 TRACE	SITE 2 TOTAL	SITE 2 POSITIVE	SITE 2 TRACE
VOLATILES	O-XYLENE	6	0	0	9	0	1
	P-XYLENE	6	0	0	9	0	0
	T-CHLOROETHYLENE	6	0	0	9	0	0
	T1,2DICHLOROETHYLENE	6	0	0	9	0	0
	TOLUENE	6	0	2	9	0	4
	TOTL TRIHALOMETHANES	6	6	0	9	9	0
	TRICHLOROETHYLENE	6	0	0	9	0	0
	TRIFLUOROCHLOROTOLUE	6	0	0	9	0	0
*TOTAL SCAN VOLATILES		167	20	7	252	29	17
*TOTAL GROUP ORGANIC		414	20	18	640	29	21
TOTAL		882	346	41	1376	542	57

KEY TO TABLES 5 AND 6

A ONTARIO DRINKING WATER OBJECTIVES
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
1*. MAC for Bacteriological Analyses
Poor water quality is indicated when :
- total coliform counts > 0 < 5
- P/A Bottle Test is present after 48 hours
- Aeromonas organisms are detected in more than 25% of samples in a single submission or in successive submissions from the same sampling site
- Pseudomonas Aeruginosa, Staphylococcus Aureus and members of the Fecal Streptococcus group should not be detected in any sample
- Standard Plate Count should not exceed 500 organisms per ml at 35 deg C within 48 hours

2. Interim Maximum Acceptable Concentration (IMAC)
3. Maximum Desirable Concentration (MDC)
4. Aesthetic or Recommended Operational Guideline
- hardness levels between 80 and 100 mg/L as calcium carbonate are considered to provide an acceptable balance between corrosion and incrustation, water supplies with a hardness >200 mg/L are considered poor and those in excess of 500 mg/L are unacceptable.

B HEALTH & WELFARE CANADA
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC

C WORLD HEALTH ORGANIZATION
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

H USSR MAXIMUM PERMISSIBLE CONCENTRATION

I NEW YORK STATE AMBIENT WATER GUIDELINE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurable Amount
<T	Greater Than Detection Limit But Not Confident
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!AW	No Data: Analysis Withdrawn
!CR	No Data: Could Not Confirm By Reanalysis
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample

RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant
UAL	Unreliable: Sample Age Exceeds Normal Limit
UCR	Unreliable: Could Not Confirm By Reanalysis
UCS	Unreliable: Contamination Suspected
UIN	Unreliable: Indeterminant Interference
XP	Positive After X Number of Hours

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	SITE 1		SITE 2	
	STANDING	FREE FLOW	STANDING	FREE FLOW
BACTERIOLOGICAL				
AEROMONAS SP (0=ABSENT)		DET'N LIMIT = N/A		GUIDELINE = 0 (A1)
MAY	.	.	.	0
AUG	.	.	.	0
SEP	.	.	.	0
E. COLI (P/A) (0=ABSENT)		DET'N LIMIT = N/A		GUIDELINE =
MAY	.	.	.	0
AUG	.	.	.	0
SEP	.	.	.	0
FECAL COLIFORM (0=ABSENT)		DET'N LIMIT = N/A		GUIDELINE = 0 (A1)
MAY	.	.	.	0
AUG	.	.	.	0
SEP	.	.	.	0
STANDRD PLATE CNT MF (CT/ML)		DET'N LIMIT = 0		GUIDELINE = 500/ML (A1)
APR	.	6	.	12
MAY	.	!LA	.	205
JUN	.	2	.	2400 >
JUL	9	.	.	51
AUG	.	!AW	.	!AW
SEP	.	.	.	145
OCT	.	.	.	112
NOV	.	!AW	.	!AW
DEC	.	.	.	!AW
P/A BOTTLE (0=ABSENT)		DET'N LIMIT = 0		GUIDELINE = 0 (A1*)
APR	.	0	.	0
MAY	.	0	.	1
JUN	.	0	.	0
JUL	0	.	.	0
AUG	.	0	.	1
SEP	.	.	.	1
OCT	.	.	.	0
NOV	.	0	.	0
DEC	.	.	.	0
STAPH AUREUS (0=ABSENT)		DET'N LIMIT = N/A		GUIDELINE = 0 (A1)
MAY	.	.	.	0
AUG	.	.	.	0
SEP	.	.	.	0

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	SITE 1		SITE 2	
	STANDING	FREE FLOW	STANDING	FREE FLOW
COLIFORM (0=ABSENT)		DET'N LIMIT = N/A		GUIDELINE = 0 (A1)
MAY	.	.	.	1
AUG	.	.	.	0
SEP	.	.	.	0
TOTAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = 5/100ML(A1)
APR	.	0	.	0
MAY	.	0	.	0
JUN	.	0	.	BDL
JUL	0	.	.	0
AUG	.	0	.	0
SEP	.	.	.	0
OCT	.	.	.	0
NOV	.	0	.	0
DEC	.	.	.	0
T COLIFORM BCKGRD MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = N/A
APR	.	0	.	0
MAY	.	0	.	27
JUN	.	0	.	100
JUL	0	.	.	630
AUG	.	0	.	0
SEP	.	.	.	680
OCT	.	.	.	0
NOV	.	0	.	0
DEC	.	.	.	0

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	SITE 1		SITE 2	
	STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (FLD)				
FLD CHLORINE (COMB) (MG/L)		DET'N LIMIT = N/A		GUIDELINE = N/A
APR	.200	.200	.	.
MAY	.	.100	.	.
JUN	.200	.300	.	.
JUL	.200	.	.100	.100
AUG	.100	.100	.	.
NOV	.100	.100	.	.
FLD CHLORINE FREE (MG/L)		DET'N LIMIT = N/A		GUIDELINE = N/A
APR	.	.200	.100	.
MAY	.	.	.100	.100
JUN	.100	.100	.100	.100
JUL	.100	.	.100	.100
AUG	.300	.100	.030	.140
SEP	.	.	.100	.100
OCT	.	.	.100	.100
NOV	.300	.300	.100	.100
DEC	.	.	.100	.100
TOTAL CHLORINE (MG/L)		DET'N LIMIT = N/A		GUIDELINE = N/A
APR	.200	.400	.100	.100
MAY	.100	.100	.100	.100
JUN	.300	.400	.100	.100
JUL	.300	.	.100	.100
AUG	.400	.200	.030	.220
SEP	.	.	.100	.100
OCT	.	.	.100	.100
NOV	.400	.400	.100	.100
DEC	.	.	.100	.100
FLD PH (DMSNLESS)		DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5 (A4)
APR	7.200	7.800	7.600	8.000
MAY	7.300	7.300	7.400	7.400
JUN	7.100	7.100	7.400	7.200
JUL	6.900	.	7.400	7.400
AUG	7.000	7.100	7.400	7.400
SEP	.	.	7.000	7.200
OCT	.	.	7.400	7.400
NOV	7.400	7.600	7.600	8.000
DEC	.	.	7.400	7.400
TEMPERATURE (DEG.C)		DET'N LIMIT = N/A		GUIDELINE = N/A
APR	9.400	4.400	13.500	5.500

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	SITE 1		SITE 2	
	STANDING	FREE FLOW	STANDING	FREE FLOW
MAY	8.300	6.700	16.500	10.000
JUN	16.100	12.200	22.000	12.000
JUL	13.300	.	20.500	15.000
AUG	6.000	5.600	18.000	14.500
SEP	.	.	19.000	14.000
OCT	.	.	16.500	13.000
NOV	8.900	6.100	16.000	9.000
DEC	.	.	16.000	10.000
FLD TURBIDITY (FTU)		DET'N LIMIT = N/A		GUIDELINE = 1.0 (A1)
APR	.	.	.	.100

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	SITE 1		SITE 2	
	STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (LAB)				
ALKALINITY (MG/L)		DET'N LIMIT = .200		GUIDELINE = 30-500 (A4)
APR	32.800	35.000	34.600	36.200
MAY	21.500	22.700	28.400	27.200
JUN	25.000	26.000	28.100	23.900
JUL	25.000	.	29.900	27.800
AUG	30.600	28.700	34.900	33.900
SEP	.	.	36.100	33.200
OCT	.	.	29.500	30.700
NOV	28.600	24.800	30.200	27.500
DEC	.	.	31.600	29.700
CALCIUM (MG/L)		DET'N LIMIT = .100		GUIDELINE = 100. (F2)
APR	19.700	20.600	21.000	21.000
MAY	15.400	16.600	17.400	17.000
JUN	15.000	15.400	16.400	15.400
JUL	17.400	.	18.200	17.600
AUG	19.000	18.000	20.800	21.000
SEP	.	.	20.000	19.800
OCT	.	.	18.600	19.400
NOV	19.800	18.600	19.800	18.800
DEC	.	.	19.400	18.600
CHLORIDE (MG/L)		DET'N LIMIT = .200		GUIDELINE = 250.0 (A3)
APR	53.000	61.000	63.000	62.500
MAY	11.500	28.000	54.500	54.000
JUN	53.000	52.000	55.000	54.500
JUL	53.500	.	54.500	54.000
AUG	55.000	54.000	54.500	55.000
SEP	.	.	55.000	54.000
OCT	.	.	54.400	54.000
NOV	44.300	39.800	54.500	54.300
DEC	.	.	56.500	56.200
COLOUR (TCU)		DET'N LIMIT = .5		GUIDELINE = 5.0 (A3)
APR	4.500	4.500	5.000	5.500
MAY	3.500	4.000	5.000	6.000
JUN	4.500	4.000	4.500	6.500
JUL	5.000	.	5.500	6.500
AUG	6.500	5.500	5.000	8.000
SEP	.	.	1.500 <T	9.500
OCT	.	.	3.500	4.000
NOV	3.000	5.500	5.500	5.000
DEC	.	.	5.500	7.000

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	SITE 1		SITE 2	
	STANDING	FREE FLOW	STANDING	FREE FLOW
CONDUCTIVITY (UMHO/CM)		DET'N LIMIT = 1		GUIDELINE = 400. (F2)
APR	312	341	349	352
MAY	155	210	304	302
JUN	288	290	296	291
JUL	297	.	305	299
AUG	301	296	309	305
SEP	.	.	317	306
OCT	.	.	310	310
NOV	268	249	305	302
DEC	.	.	329	318
FLUORIDE (MG/L)		DET'N LIMIT = .01		GUIDELINE = 2.400 (A1)
APR	1.060	1.020	1.000	1.030
MAY	1.100	1.050	.930	.910
JUN	.870	.930	.780	.740
JUL	.820	.	.860	.790
AUG	.820	.800	.900	.880
SEP	.	.	.900	1.000
OCT	.	.	1.180	1.200
NOV	.740	.740	.880	.940
DEC	.	.	.980	1.040
HARDNESS (MG/L)		DET'N LIMIT = .500		GUIDELINE = 80-100 (A4)
APR	68.000	71.500	72.500	73.500
MAY	51.000	56.000	62.000	62.000
JUN	56.000	57.000	61.000	58.000
JUL	63.000	.	66.000	64.000
AUG	68.000	65.000	72.000	72.000
SEP	.	.	72.000	71.000
OCT	.	.	65.000	68.000
NOV	70.000	65.000	71.000	68.000
DEC	.	.	69.000	68.000
MAGNESIUM (MG/L)		DET'N LIMIT = .050		GUIDELINE = 30. (F2)
APR	4.600	4.900	4.900	5.100
MAY	3.100	3.600	4.500	4.800
JUN	4.600	4.500	4.700	4.600
JUL	4.700	.	4.900	4.800
AUG	5.000	4.900	4.800	4.700
SEP	.	.	5.300	5.200
OCT	.	.	4.600	4.900
NOV	4.900	4.500	5.200	5.100
DEC	.	.	5.200	5.300

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	SITE 1		SITE 2	
	STANDING	FREE FLOW	STANDING	FREE FLOW
SODIUM (MG/L)		DET'N LIMIT = .200		GUIDELINE = 200. (C3)
APR	29.600	33.600	34.900	35.100
MAY	7.400	14.400	30.000	30.000
JUN	29.800	29.000	29.600	29.400
JUL	29.400	.	29.800	30.400
AUG	29.800	30.600	30.800	30.200
SEP	.	.	31.000	30.800
OCT	.	.	31.600	30.600
NOV	24.200	22.000	30.800	30.400
DEC	.	.	33.600	33.000
AMMONIUM TOTAL (MG/L)		DET'N LIMIT = 0.002		GUIDELINE = .05 (F2)
APR	.022	.014	.024	.024
MAY	.010	.012	.038	.016
JUN	.022	.014	.024	.014
JUL	.034	.	.046	.012
AUG	.012	.010	.082	.006 <T
SEP	.	.	.070	.012
OCT	.	.	.032	.012
NOV	.006 <T	.002 <T	.006 <T	.002 <T
DEC	.	.	.002 <T	.004 <T
NITRITE (MG/L)		DET'N LIMIT = 0.001		GUIDELINE = 1.000 (A1)
APR	.008	.006	.008	.007
MAY	.003 <T	.001 <T	.002 <T	.002 <T
JUN	.006	.006	.005	.005
JUL	.003 <T	.	.004 <T	.004 <T
AUG	.001 <T	.001 <T	.006	.002 <T
SEP	.	.	.004 <T	.004 <T
OCT	.	.	.003 <T	.001 <T
NOV	.001 <T	BDL	BDL	BDL
DEC	.	.	.002 <T	.001 <T
TOTAL NITRATES (MG/L)		DET'N LIMIT = .020		GUIDELINE = 10.000 (A1)
APR	.115	.100	.095 <T	.105
MAY	.135	.065 <T	.035 <T	.030 <T
JUN	.045 <T	.040 <T	.035 <T	.030 <T
JUL	.075 <T	.	.070 <T	.065 <T
AUG	.150	.150	.160	.155
SEP	.	.	.165	.165
OCT	.	.	.030 <T	.025 <T
NOV	.045 <T	.060 <T	BDL	BDL
DEC	.	.	.610	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	SITE 1		SITE 2	
	STANDING	FREE FLOW	STANDING	FREE FLOW
NITROGEN TOT KJELD (MG/L)		DET'N LIMIT = .020		GUIDELINE = N/A
APR	.200	.180	.240	.330
MAY	.170	.150	.290	.220
JUN	.240	.190	.220	.230
JUL	.190	.	.310	.180
AUG	.200	.180	.550	.180
SEP	.	.	.600	.250
OCT	.	.	.360	.290
NOV	.210	.190	.210	.210
DEC	.	.	.290	.230
PH (DMSNLESS)		DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)
APR	7.910	8.100	7.860	7.950
MAY	7.560	7.660	7.630	7.680
JUN	7.550	7.650	7.700	7.540
JUL	7.400	.	7.530	7.530
AUG	7.530	7.380	7.500	7.660
SEP	.	.	7.690	7.600
OCT	.	.	7.590	7.900
NOV	7.610	7.570	7.750	7.640
DEC	.	.	7.740	7.770
RESIDUE (TOTAL) (MG/L)		DET'N LIMIT = 1.		GUIDELINE = 500. (A3)
APR	203 CRO	222 CRO	227 CRO	229 CRO
MAY	101 CRO	137 CRO	198 CRO	196 CRO
JUN	187 CRO	189 CRO	192 CRO	189 CRO
JUL	193	.	198	194
AUG	189	190	196	198
SEP	.	.	206 CRO	199 CRO
OCT	.	.	202 CRO	202 CRO
NOV	172 CRO	160 CRO	193 CRO	190 CRO
DEC	.	.	214 CRO	207 CRO
TURBIDITY (FTU)		DET'N LIMIT = .02		GUIDELINE = 1.00 (A1)
APR	.780	.750	.640	1.200
MAY	.550	.320	.500	.460
JUN	2.900	.320	.490	1.380
JUL	.360	.	.650	.520
AUG	1.480	.640	1.160	1.060
SEP	.	.	2.600	2.500
OCT	.	.	.570	.550
NOV	1.510	.680	.840	.980
DEC	.	.	1.450	.950

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	SITE 1		SITE 2	
	STANDING	FREE FLOW	STANDING	FREE FLOW
METALS				
ALUMINUM (MG/L)		DET'N LIMIT = .004		GUIDELINE = .10 (A4)
APR	.043	.030	.017	.033
MAY	.021	.014	.005	.007
JUN	.052	BDL	BDL	!RE
JUL	BDL	.	BDL	.000
AUG	.036	.011	.005	.011
SEP	.	.	.021	.015
OCT	.	.	.013	.012
NOV	.034	.030	.016	.032
DEC	.	.	!IS	.022
BARIUM (MG/L)		DET'N LIMIT = 0.001		GUIDELINE = 1.000 (A1)
APR	.016	.018	.016	.018
MAY	.016	.018	.024	.016
JUN	.028	.025	.029	!RE
JUL	.027	.	.030	.024
AUG	.019	.021	.016	.015
SEP	.	.	.021	.018
OCT	.	.	.009	.010
NOV	.014	.015	.012	.016
DEC	.	.	!IS	.017
BORON (MG/L)		DET'N LIMIT = 0.01		GUIDELINE = 5.000 (A1)
APR	.020	.010	.020	.020
MAY	.040 <T	.010 <T	.010 <T	.020 <T
JUN	.020 <T	.020 <T	.010 <T	!BT
JUL	.010 <T	.	.010 <T	BDL
AUG	.010 <T	.010 <T	.010 <T	.020 <T
SEP	.	.	BDL	BDL
OCT	.	.	BDL	BDL
NOV	.022 <T	.024 <T	.025 <T	.022 <T
DEC	.	.	.009 <T	.013 <T
CADMIUM (UG/L)		DET'N LIMIT = 0.300		GUIDELINE = 5.000 (A1)
APR	BDL	BDL	BDL	BDL
MAY	BDL	BDL	.300	BDL
JUN	.600	BDL	.400	!RE
JUL	.600	.	.800	.400
AUG	.400	.400	.600	.300
SEP	.	.	.900	.400
OCT	.	.	BDL	BDL
NOV	BDL	BDL	BDL	BDL
DEC	.	.	!IS	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	SITE 1		SITE 2	
	STANDING	FREE FLOW	STANDING	FREE FLOW
COBALT (MG/L)			DET'N LIMIT = 0.001	GUIDELINE = 1.0 (H)
APR	BDL	BDL	BDL	.001
MAY	BDL	BDL	BDL	BDL
JUN	.002	BDL	BDL	!RE
JUL	BDL	.	BDL	.000
AUG	BDL	BDL	BDL	BDL
SEP	.	.	.001	.001
OCT	.	.	BDL	BDL
NOV	BDL	BDL	BDL	BDL
DEC	.	.	!IS	.001
CHROMIUM (MG/L)			DET'N LIMIT = 0.001	GUIDELINE = .05 (A1)
APR	BDL	BDL	BDL	BDL
MAY	BDL	BDL	BDL	BDL
JUN	BDL	BDL	BDL	!RE
JUL	BDL	.	BDL	.000
AUG	BDL	BDL	BDL	BDL
SEP	.	.	.003	.002
OCT	.	.	BDL	BDL
NOV	.001	BDL	.001	.001
DEC	.	.	!IS	BDL
COPPER (MG/L)			DET'N LIMIT = .001	GUIDELINE = 1.0 (A3)
APR	.073	.030	.310	.074
MAY	.088	.045	.380	.120
JUN	.350	.100	.700	!RE
JUL	.120	.	.760	.194
AUG	.170	.110	.800	.160
SEP	.	.	1.500	.330
OCT	.	.	.330	.040
NOV	.026	.016	.400	.037
DEC	.	.	!IS	.045
IRON (MG/L)			DET'N LIMIT = .002	GUIDELINE = .300 (A3)
APR	.098	.070	.060	.140
MAY	.074	.062	.072	.150
JUN	.270	.080	.150	!RE
JUL	.080	.	.230	.280
AUG	.140	.095	.070	.150
SEP	.	.	.320	.250
OCT	.	.	.061	.047
NOV	.047	.041	.058	.100
DEC	.	.	!IS	.180

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	SITE 1		SITE 2	
	STANDING	FREE FLOW	STANDING	FREE FLOW
MERCURY (UG/L)		DET'N LIMIT = 0.010		GUIDELINE = 1.000 (A1)
APR	.	BDL	.	.010
MAY	.	BDL	.	BDL
JUN	.	BDL	.	BDL
JUL	.010	.	.	BDL
AUG	.	!SS	.	!SS
SEP	.	.	.	.010
OCT	.	.	.	.010
NOV	.	.010	.	.010
DEC	.	.	.	.010
MANGANESE (MG/L)		DET'N LIMIT = .001		GUIDELINE = .050 (A3)
APR	.048	.053	.029	.086
MAY	.015	.013	.015	.016
JUN	.240	.016	.020	!RE
JUL	.020	.	.045	.035
AUG	.059	.050	.028	.054
SEP	.	.	.100	.110
OCT	.	.	.009	.012
NOV	.009	.008	.007	.012
DEC	.	.	!IS	.013
NICKEL (MG/L)		DET'N LIMIT = 0.001		GUIDELINE = .05 (F3)
APR	.087	.120	.071	.120
MAY	.097	.097	.260	.130
JUN	.320	.200	.280	!RE
JUL	.230	.	.300	.240
AUG	.160	.200	.120	.110
SEP	.	.	.230	.160
OCT	.	.	.030	.040
NOV	.068	.072	.030	.083
DEC	.	.	!IS	.110
LEAD (MG/L)		DET'N LIMIT = 0.003		GUIDELINE = .050 (A1)
APR	.015	BDL	.004	BDL
MAY	.007	.003	.010	.004
JUN	.023	.004	.017	!RE
JUL	BDL	.	.011	.004
AUG	.007	.007	.008	BDL
SEP	.	.	.015	BDL
OCT	.	.	.005	BDL
NOV	.009	BDL	.022	BDL
DEC	.	.	!IS	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	SITE 1		SITE 2	
	STANDING	FREE FLOW	STANDING	FREE FLOW
STRONTIUM (MG/L)			DET'N LIMIT = .001	GUIDELINE = 2.00 (H)
APR	.051	.057	.057	.057
MAY	.036	.043	.054	.051
JUN	.052	.052	.058	!RE
JUL	.064	.	.069	.063
AUG	.047	.052	.047	.047
SEP	.	.	.053	.049
OCT	.	.	.043	.045
NOV	.041	.042	.047	.049
DEC	.	.	!IS	.052
URANIUM (UG/L)			DET'N LIMIT = .02	GUIDELINE = 20. (A2)
APR	.050	.050	.050	.050
MAY	.010	.020	.010	.020
JUN	.030	.010	BDL	!BT
JUL	.030	.	.020	.030
AUG	BDL	BDL	BDL	.020
SEP	.	.	.010	.020
OCT	.	.	BDL	.100
NOV	BDL	BDL	BDL	BDL
DEC	.	.	BDL	BDL
ZINC (MG/L)			DET'N LIMIT = .001	GUIDELINE = 5.00 (A3)
APR	.040	.008	.050	.014
MAY	.020	.007	.067	.010
JUN	.074	.021	.078	!RE
JUL	.029	.	.110	.022
AUG	.031	.042	.130	.011
SEP	.	.	.120	.019
OCT	.	.	.037	.003
NOV	.036	.004	.130	.004
DEC	.	.	!IS	.005

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT				DISTRIBUTION SYSTEM
	SITE 1		SITE 2		
	STANDING	FREE FLOW	STANDING	FREE FLOW	
CHLOROAROMATICS					
123 TRICHLOROBENZENE (NG/L)		DET'N LIMIT = 5.000			GUIDELINE = 10000. (I)
APR	.	BDL	.	BDL	
MAY	.	BDL	.	BDL	
JUN	.	7.000 <T	.	BDL	
JUL	.	.	.	BDL	
AUG	.	BDL	.	!QU	
SEP	.	.	.	BDL	
OCT	.	.	.	BDL	
NOV	.	BDL	.	BDL	
DEC	.	.	.	BDL	
1245 T-CHLOROBENZENE (NG/L)		DET'N LIMIT = 1.000			GUIDELINE = 38000. (D4)
APR	.	3.000 <T	.	BDL	
MAY	.	BDL	.	BDL	
JUN	.	1.000 <T	.	BDL	
JUL	.	.	.	BDL	
AUG	.	BDL	.	!QU	
SEP	.	.	.	BDL	
OCT	.	.	.	BDL	
NOV	.	BDL	.	BDL	
DEC	.	.	.	BDL	
HEXACHLOROETHANE (NG/L)		DET'N LIMIT = 1.000			GUIDELINE = 1900. (D4)
APR	.	2.000 <T	.	BDL	
MAY	.	5.000 <T	.	BDL	
JUN	.	1.000 <T	.	BDL	
JUL	.	.	.	BDL	
AUG	.	BDL	.	!QU	
SEP	.	.	.	BDL	
OCT	.	.	.	BDL	
NOV	.	BDL	.	BDL	
DEC	.	.	.	BDL	

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	SITE 1		SITE 2	
	STANDING	FREE FLOW	STANDING	FREE FLOW
PESTICIDES & PCB				
ALPHA BHC (NG/L)		DET'N LIMIT = 1.000		GUIDELINE = 700. (G)
APR	.	2.000 <T	.	BDL
MAY	.	3.000 <T	.	BDL
JUN	.	2.000 <T	.	3.000 <T
JUL	.	.	.	BDL
AUG	.	3.000 <T	.	!QU
SEP	.	.	.	2.000 <T
OCT	.	.	.	BDL
NOV	.	1.000 <T	.	1.000 <T
DEC	.	.	.	2.000 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT				DISTRIBUTION SYSTEM
	SITE 1		SITE 2		
	STANDING	FREE FLOW	STANDING	FREE FLOW	
VOLATILES					
BENZENE (UG/L)		DET'N LIMIT = 0			GUIDELINE = 5.0 (D1)
APR	.	BDL	.	BDL	
MAY	.	BDL	.	BDL	
JUN	.	BDL	.	BDL	
JUL	BDL	.	.	BDL	
AUG	.	BDL	.	BDL	
SEP	.	.	.	BDL	
OCT	.	.	.	BDL	
NOV	.	.050 <T	.	.650	
DEC	.	.	.	BDL	
TOLUENE (UG/L)		DET'N LIMIT = 0			GUIDELINE = 100.0 (G)
APR	.	BDL	.	BDL	
MAY	.	.300 <T	.	.400 <T	
JUN	.	BDL	.	.200 <T	
JUL	BDL	.	.	BDL	
AUG	.	BDL	.	BDL	
SEP	.	.	.	BDL	
OCT	.	.	.	.150 <T	
NOV	.	.050 <T	.	.050 <T	
DEC	.	.	.	BDL	
ETHYLBENZENE (UG/L)		DET'N LIMIT = 0			GUIDELINE = 3400. (D3)
APR	.	BDL	.	BDL	
MAY	.	BDL	.	.100 <T	
JUN	.	BDL	.	BDL	
JUL	BDL	.	.	BDL	
AUG	.	BDL	.	.300 <T	
SEP	.	.	.	BDL	
OCT	.	.	.	BDL	
NOV	.	BDL	.	.050 <T	
DEC	.	.	.	BDL	
P-XYLENE (UG/L)		DET'N LIMIT = 0			GUIDELINE = 620. (G)
APR	.	BDL	.	BDL	
MAY	.	BDL	.	.000 RMP	
JUN	.	BDL	.	BDL	
JUL	BDL	.	.	BDL	
AUG	.	BDL	.	BDL	
SEP	.	.	.	BDL	
OCT	.	.	.	BDL	
NOV	.	BDL	.	BDL	
DEC	.	.	.	BDL	

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	SITE 1		SITE 2	
	STANDING	FREE FLOW	STANDING	FREE FLOW
M-XYLENE (UG/L)		DET'N LIMIT = 0		GUIDELINE = 620. (G)
APR	.	BDL	.	BDL
MAY	.	BDL	.	.100 <T
JUN	.	BDL	.	BDL
JUL	BDL	.	.	BDL
AUG	.	BDL	.	BDL
SEP	.	.	.	BDL
OCT	.	.	.	BDL
NOV	.	BDL	.	BDL
DEC	.	.	.	BDL
O-XYLENE (UG/L)		DET'N LIMIT = 0		GUIDELINE = 620. (G)
APR	.	BDL	.	BDL
MAY	.	BDL	.	.050 <T
JUN	.	BDL	.	BDL
JUL	BDL	.	.	BDL
AUG	.	BDL	.	BDL
SEP	.	.	.	BDL
OCT	.	.	.	BDL
NOV	.	BDL	.	BDL
DEC	.	.	.	BDL
1,1 DICHLOROETHYLENE (UG/L)		DET'N LIMIT = 0		GUIDELINE = 7.0 (D1)
APR	.	BDL	.	BDL
MAY	.	BDL	.	BDL
JUN	.	.000 SPS	.	.000 SPS
JUL	BDL	.	.	BDL
AUG	.	BDL	.	BDL
SEP	.	.	.	BDL
OCT	.	.	.	BDL
NOV	.	BDL	.	BDL
DEC	.	.	.	BDL
CHLOROFORM (UG/L)		DET'N LIMIT = 0		GUIDELINE = 350.0 (A1+)
APR	.	40.000	.	33.000
MAY	.	43.700	.	34.200
JUN	.	25.500	.	27.200
JUL	36.000	.	.	35.000
AUG	.	33.100	.	42.900
SEP	.	.	.	37.900
OCT	.	.	.	37.400
NOV	.	61.000	.	31.000
DEC	.	.	.	28.100

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	SITE 1		SITE 2	
	STANDING	FREE FLOW	STANDING	FREE FLOW
111, TRICHLOROETHANE (UG/L)		DET'N LIMIT = 0		GUIDELINE = 200. (D1)
APR	.	BDL	.	.700 <T
MAY	.	BDL	.	BDL
JUN	.	BDL	.	BDL
JUL	BDL	.	.	BDL
AUG	.	BDL	.	BDL
SEP	.	.	.	BDL
OCT	.	.	.	BDL
NOV	.	BDL	.	BDL
DEC	.	.	.	BDL
DICHLOROBROMOMETHANE (UG/L)		DET'N LIMIT = 0		GUIDELINE = 350.0 (A1+)
APR	.	7.000	.	6.000
MAY	.	3.900	.	6.850
JUN	.	6.300	.	5.400
JUL	8.000	.	.	8.000
AUG	.	7.800	.	8.900
SEP	.	.	.	7.000
OCT	.	.	.	6.500
NOV	.	9.800	.	7.200
DEC	.	.	.	7.000
CHLORODIBROMOMETHANE (UG/L)		DET'N LIMIT = 0		GUIDELINE = 350.0 (A1+)
APR	.	.900 <T	.	.800 <T
MAY	.	.300 <T	.	.700 <T
JUN	.	.800 <T	.	.700 <T
JUL	.800 <T	.	.	.800 <T
AUG	.	1.000	.	1.200
SEP	.	.	.	.800 <T
OCT	.	.	.	BDL
NOV	.	1.200	.	.900 <T
DEC	.	.	.	.700 <T
TOTL TRIHALOMETHANES (UG/L)		DET'N LIMIT = 0		GUIDELINE = 350.0 (A1)
APR	.	47.900	.	39.800
MAY	.	47.900	.	41.750
JUN	.	32.600	.	33.300
JUL	44.800	.	.	43.800
AUG	.	41.900	.	53.000
SEP	.	.	.	45.700
OCT	.	.	.	43.900
NOV	.	72.000	.	39.100
DEC	.	.	.	35.800

TABLE 6

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

COUNT OF PARAMETERS NOT FOUND ABOVE THE DETECTION LIMIT

SCAN	PARAMETER	ANALYSED	DETECTION LIMIT	GUIDELINE	
CHEMISTRY (LAB)	CYANIDE	15	0.001	.200 (A1)	MG/L
METALS	ARSENIC	29	0.001	.050 (A1)	MG/L
	BERYLLIUM	29	0.001	.0002 (H)	MG/L
	MOLYBDENUM	29	0.001	.50 (H)	MG/L
	SELENIUM	29	0.001	.010 (A1)	MG/L
	VANADIUM	29	.001	.10 (H)	MG/L
CHLOROAROMATICS	HEXACHLOROBUTADIENE	14	1.000	450. (D4)	NG/L
	1234 T-CHLOROBENZENE	14	1.000	10000. (I)	NG/L
	1235 T-CHLOROBENZENE	14	1.000	10000. (I)	NG/L
	124 TRICHLOROBENZENE	14	5.000	10000. (I)	NG/L
	135 TRICHLOROBENZENE	14	5.000	10000. (D4)	NG/L
	OCTACHLOROSTYRENE	14	1.000	N/A	NG/L
	PENTACHLOROBENZENE	14	1.000	74000. (D4)	NG/L
	236 TRICHLOROTOLUENE	14	5.000	N/A	NG/L
	245 TRICHLOROTOLUENE	14	5.000	N/A	NG/L
	26A TRICHLOROTOLUENE	14	5.000	N/A	NG/L
PESTICIDES & PCB	ALDRIN	14	1.000	700.0 (A1)	NG/L
	BETA BHC	14	1.000	300. (G)	NG/L
	LINDANE	14	1.000	4000.0 (A1)	NG/L
	ALPHA CHLORDANE	14	2.000	7000.0 (A1)	NG/L
	GAMMA CHLORDANE	14	2.000	7000.0 (A1)	NG/L
	DIELDRIN	14	2.000	700.0 (A1)	NG/L
	METHOXYCHLOR	14	5.000	100000.(A1)	NG/L
	THIODAN I	14	2.000	74000. (D4)	NG/L
	THIODAN II	14	4.000	74000. (D4)	NG/L
	ENDRIN	14	4.000	200.0 (A1)	NG/L
	THIODAN SULPHATE	14	4.000	N/A	NG/L
	HEPTACHLOR EPOXIDE	14	1.000	3000.0 (A1)	NG/L
	HEPTACHLOR	14	1.000	3000.0 (A1)	NG/L
	MIREX	14	5.000	N/A	NG/L
	OXYCHLORDANE	14	2.000	N/A	NG/L
	OPDDT	14	5.000	30000. (A1)	NG/L
	PCB	14	20.000	3000. (A2)	NG/L
	PP-DDD	14	5.000	N/A	NG/L
	PPDDE	14	1.000	30000. (A1)	NG/L
	PPDDT	14	5.000	30000. (A1)	NG/L
	ATRATONE	15	50.	N/A	NG/L
	ALACHLOR	15	500.	35000. (D2)	NG/L
	ETHYLENE DIBROMIDE	15	0	50.0 (G)	UG/L
	HCB	14	1.000	10.0 (C1)	NG/L
SPECIFIC PESTICIDES	TOXAPHENE	14	N/A	5000. (A1)	NG/L
	AMETRYNE	15	50.00	300000.(D3)	NG/L
	ATRAZINE	15	50.00	60000. (B3)	NG/L
	BLADEX	15	100.00	10000. (B3)	NG/L
	PROMETONE	15	50.00	52500. (D3)	NG/L
	PROPAZINE	15	50.00	16000. (D2)	NG/L
	PROMETRYNE	15	50.00	1000. (B3)	NG/L

TABLE 6

DRINKING WATER SURVEILLANCE PROGRAM SUDBURY, RAMSEY LAKE W.T.P. 1987

COUNT OF PARAMETERS NOT FOUND ABOVE THE DETECTION LIMIT

SCAN	PARAMETER	ANALYSED	DETECTION LIMIT	GUIDELINE	
SPECIFIC PESTICIDES	SENCOR	15	100.00	80000. (B2)	NG/L
	SIMAZINE	15	50.00	10000. (B3)	NG/L
	METOLACHLOR	15	500.	50000. (B3)	NG/L
VOLATILES	DICHLOROMETHANE	15	0	1750. (D3)	UG/L
	T1,2DICHLOROETHYLENE	15	0	350. (D3)	UG/L
	1,1 DICHLOROETHANE	15	0	N/A	UG/L
	1,2 DICHLOROETHANE	15	0	5.0 (D1)	UG/L
	CARBON TETRACHLORIDE	15	0	5.0 (D1)	UG/L
	1,2 DICHLOROPROPANE	15	0	10.0 (G)	UG/L
	TRICHLOROETHYLENE	15	0	5.0 (D1)	UG/L
	112 TRICHLOROETHANE	15	0	.60 (D4)	UG/L
	T-CHLOROETHYLENE	15	0	10.0 (C2)	UG/L
	BROMOFORM	15	0	350.0 (A1+)	UG/L
	1122 T-CHLOROETHANE	15	0	0.17 (D4)	UG/L
	CHLOROBENZENE	15	0	1510. (D3)	UG/L
	1,4 DICHLOROBENZENE	15	0	75.0 (D1)	UG/L
	1,3 DICHLOROBENZENE	15	0	130. (G)	UG/L
	1,2 DICHLOROBENZENE	15	0	130. (G)	UG/L
	TRIFLUOROCHLOROTOLUE	15	0	N/A	UG/L

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality,
- a flagging mechanism for 'Objective' exceedence,
- a definition of contaminant levels and trends,
- a comprehensive background for remedial action,
- a framework for assessment of new contaminants,
- and an indication of treatment efficiency of plant processes.

Program

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario; currently 44 plants are being monitored. Water supply locations have been prioritized for surveillance, based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit. It is estimated that after 4 years of operation, the program will be monitoring 90 locations.

A major goal of the program is to collect valid water quality data, in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analysed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling in order to acquire complete plant process and distribution system details, and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of the raw (ambient water) and the treated water at the treatment plant, and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled.

Sampling is carried out by operational personnel who have been trained in the applicable procedures.

Comprehensive standardized procedures and Field Test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". All laboratory analyses are carried out by the MOE Laboratory Services Branch.

Data Reporting Mechanism

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP co-ordinator.

DWSP INPUTS AND OUTPUTS

The DWSP INPUTS and OUTPUTS are illustrated in Fig. 1.

PROGRAM INPUTS

PLANT AND DISTRIBUTION SYSTEM DESCRIPTION

The system description includes plant specific non-analytical information acquired through a questionnaire and initial plant visit. During the initial assessment of the plant and distribution system the questionnaire content is verified and

missing information added. It is intended that all data be kept current with scheduled annual updates.

The PLANT and DISTRIBUTION SYSTEM DESCRIPTION consists of the following seven components.

1. Process component inventory

All physical and chemical processes that the water is subjected to, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. Treatment chemicals

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. The chemical dosages applied on the day of sampling are recorded in DWSP.

3. Process control measurements

Documentation of in-plant monitoring of process parameters (turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. In-plant monitoring results are generally not retained in DWSP but are retained by the Water Treatment Plant.

4. Design flow and retention time

The hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. The maximum, minimum and average flow as well as a record of the flow rate on the day of sampling are recorded in DWSP.

5. Distribution system description

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. Sampling system

Each plant is assessed for its adequacy in terms of sampling of bacteriological, organic and inorganic parameters. The prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant, preferably a lab area;

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake, discharge and tap), pump characteristics (model, type, capacity) and flow rate.

7. People

This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate Ministry of Environment personnel associated with the plant.

FIELD DATA

The second major input to DWSP is field data.

Field data is collected at the plant and from the distribution system sites on the day of sampling. The field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling as well as monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free,combined and total), temperature and pH. These parameters are analysed according to standardized DWSP protocols to allow for interplant comparison.

LABORATORY ANALYTICAL DATA

The third major input to DWSP is Laboratory Analytical Data.

Samples gathered from the raw, treated and distribution sampling sites are analyzed for approximately 160 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. The parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments parameters may be measured for in a "scan" producing some results for parameters that are not on the DWSP priority list but which may be of interest. The majority of the parameters are measured on a routine basis however, those that are technically more difficult and/or costly to analyse for are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change notation will be made and intercomparison data documented.

PARAMETER REFERENCE INFORMATION

The fourth major input to DWSP is Parameter Reference Information

This is a catalogue of information for each substance analysed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database.

An example is shown in fig. 2.

A written copy (hard version) of the Parameter Reference Information will be available in the near future and is a new and sophisticated enhancement to the DWSP.

PROGRAM OUTPUTS

There are four major program outputs, Query, Action Alert, Report Generation and the Annual Report.

QUERY

All DWSP information is easily accessed through the Query function, therefore anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

ACTION ALERTS

Drinking Water quality in Ontario is evaluated against provincial objectiyes as outlined in the publication, Ontario Drinking Water Objectives (ISBN 0-7729-2725-1 revised 1983). This publication contains health-related Maximum Acceptable Concentrations for thirty substances. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedences at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, other agency guidelines which are documented in the Parameter Reference Information may be used. If these guidelines are exceeded the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

REPORT GENERATION

Custom reports can be generated from DWSP to meet the needs of the regions and to respond to public requests.

ANNUAL REPORTS

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG. 1

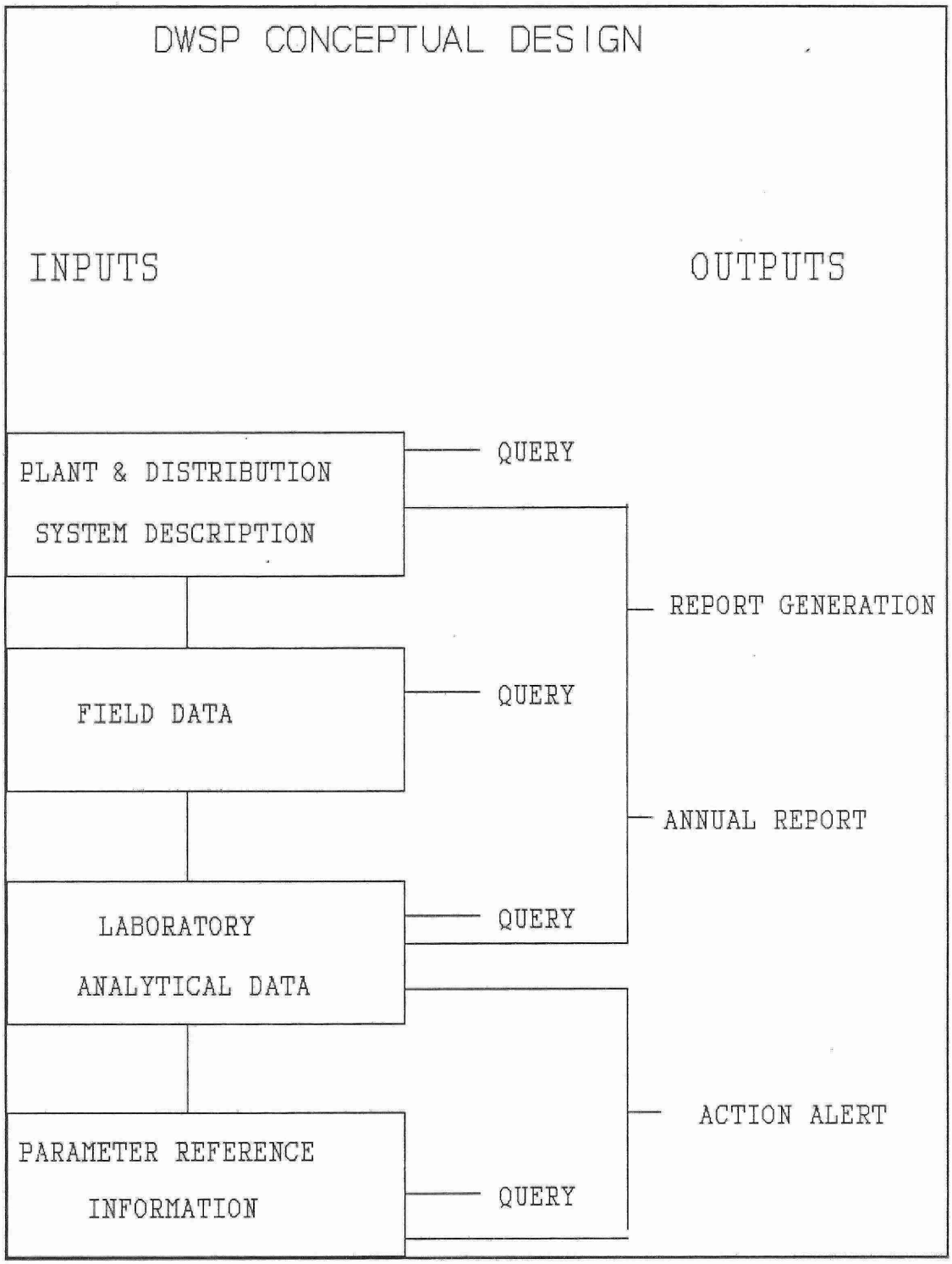

DWSP CONCEPTUAL DESIGN
INPUTS
OUTPUTS
PLANT & DISTRIBUTION SYSTEM DESCRIPTION
FIELD DATA
LABORATORY ANALYTICAL DATA
PARAMETER REFERENCE INFORMATION
QUERY
QUERY
QUERY
QUERY
REPORT GENERATION
ANNUAL REPORT
ACTION ALERT

FIG.2

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

(B2001P) PARAMETER
REFERENCE
BENZENE

SOURCE	FROM	TO	METHOD	TARG	UNIT	NOTE
EPA	C 86/04		NOMETH	.00	063000 UG/L	RMCL
EPAA	C 80/11		NOMETH	6.60	063000 UG/L	
FERC	C 84/05		NOMETH	1.00	063000 UG/L	
WHO	C 84/01		NOMETH	10.00	064000 UG/L	

DESCRIPTION: NAME: BENZENE
CAS#: 71432
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 UG/L
SYNONYMS: BENZOLE, COAL NAPHTHA, CARBON OIL (27), CYCLOHEXATRIENE (41)
CHARACTERISTICS: COLOURLESS TO LIGHT YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC, VAPOURS BURN WITH SMOKING FLAME (30)
PROPERTIES:
SOLUBILITY IN WATER: 1780-1800 MG/L AT 25 DEG C (41)
THRESHOLD ODOUR: NO DATA
THRESHOLD TASTE: 0.5 MG/L IN WATER (39)
ENVIRONMENTAL FATE: MAY BIOACCUMUALTE IN LIVING ORGANISMS, APPEARS TO BIOACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT HIGH LIPID CONTENT OR ARE MAJOR METABOLIC SITES (LIVER, BRAIN), SMALL QUANITIES EVAPORATE FROM SOIL OR DEGRADE QUICKLY
SOURCES: PETROLEUM REFINING, SOLVENT RECOVERY, COAL TAR DISTILLATION, FOOD PROCESSING, TANNING.
USES: PREPERATION OF ETHYL BENZENE USED AS A STYRENE MONOMER, DETERGENTS, NYLON, AS INTERMEDIATE IN PESTICIDE PRODUCTION, SOLVENT IN RUBBER INDUSTRY, DEGREASING AND CLEANSING AGENT, GASOLINE.
TOXICITY: RATING 4 (VERY TOXIC); ACUTE - IRRITATES MUCOUS MEMBRANES, SYMPTONS INCLUDE RESTLESSNESS, CONVULSIONS, DEPRESSION, RESPIRATORY FAILURE; CHRONIC - ANEMIA AND LEUKEMIA (45).
CARINOGENICITY: HUMAN CARCINOGEN AND MUTAGEN
REMOVAL: GAC ADSORPTION, PRECIPITATION WITH ALUM FOLLOWED BY SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION (41).
MOLECULAR WEIGHT: 78.12 GRAMS
MELTING POINT: 5.5 DEGREES C (27)
BOILING POINT: 80.1 DEGREES C (27)
SPECIFIC GRAVITY: 0.879 AT 20 DEGREES C (27)
VAPOUR PRESSURE: 100 MM AT 26.1 DEGREES C
HENRY'S LAW CONSTANT: 0.00555 ATM M_3/MOLE
LOG OCT./WATER PAR.COEFF: K=1.0 1/N=1.6 R=.97 PH=5.3

Appendix B

DWSP SAMPLING GUIDELINE

i) RAW and TREATED at PLANT

General Chemistry	-500 mL clear plastic bottle -rinse bottle with sample three times and discard water -fill to line
Bacti	-250 mL clear glass bottle with white seal on cap -do not rinse bottle; preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)
Volatiles (OPOPUP)	-250 mL clear glass bottle -do not rinse bottle -tilt bottle when filling -fill bottle completely; there should be no air bubbles.
Organic (OWOC),(OWTRI),(OAPAHX)	-1 liter brown glass bottle per scan -do not rinse bottle -fill to approx. 1" from top -when 'special pesticides' are requested three extra bottles per sample must be submitted
Cyanide	-500 mL clear plastic bottle -do not rinse bottle -fill to approx. 1" from top -add 10 drops sodium hydroxide (**Caution:** NaOH is corrosive)

Mercury	-250 mL clear glass bottle -rinse bottle and cap three times, discard then fill to top of label -add 20 drops each nitric acid and potassium dichromate (**Caution:** HNO_3 and $KCrO_7$ corrosive)
Phenols	-250 mL clear glass bottle -do <u>not</u> rinse bottle -fill to top of label as marked

<u>Steps</u>

1. Let cold water tap run for several minutes.
2. Record time in submission sheet.
3. Record teperature on submission sheet.
4. Fill up all bottles as per instructions.
5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL clear palstic bottle -rinse bottle with sample three times and discard -fill to line
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)

Steps:

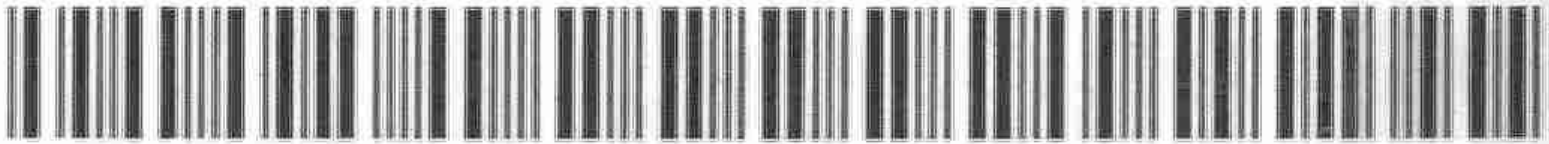
1. Record time on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL clear plastic bottle -rinse bottle with sample three times and discard water -fill to line
Bacti	-250 mL clear glass bottle with white seal on cap -do <u>not</u> rinse bottle; preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)
Volatiles (OPOPUP)	-250 mL clear glass bottle -do <u>not</u> rinse bottle; preservative has been added -tilt bottle when filling -fill bottle completely; there should be no air bubbles
Organic (OWOC),(OWTRI)	-1 liter brown glass bottle per scan -do <u>not</u> rinse bottle: preservative has been added -fill to approx. 1" from top
Cyanide	-500 mL clear plastic bottle -do <u>not</u> rinse bottle: preservative has been added -fill to approx. 1" from top -add 10 drops sodium hydroxide **(Caution:** NaOH is corrosive)
Mercury	-250 mL clear glass bottle -rinse bottle and cap three times, discard then fill to top of label -add 20 drops each nitric acid and potassium dichromate (**Caution:** HNO_3 and KCrO7 corrosive)

Steps:

1. Record time on submission sheet.
2. Let cold water flow for ten minutes.
3. Record temperature on submission sheet.
4. Fill all bottles as per instructions.
5. Record chlorine residuals (free, combined and total), tubidity and pH on submission sheet.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